FILBERTWORM SEX PHEROMONE
Identification and Field Tests of \((E,E)\)- and \((E,Z)\)-8,10-Dodecadien-1-ol Acetates


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Abstract—\((E,E)\)- and \((E,Z)\)-8,10-Dodecadien-1-ol acetates were identified in a 1:4.3 ratio in the extract of abdominal tips of female filbertworm moths, \textit{Melissopus latiferreanus} (Walsingham). The identifications were based on electroantennogram (EAG) analysis, gas chromatography, mass spectrometry, ozonolysis, and synthesis. The \(E,Z\) isomer produced the stronger EAG response. In the field tests of various ratios of \(E,E:E,Z\), the ratio found in the extract captured the most males. The pure \(E,E\) isomer initially was not attractive by itself (\(<0.1\%\) \(E,Z\)) but became attractive after a few days, presumably because of isomerization. The \(E,Z\) isomer (\(<0.1\%\) \(E,E\)) was attractive initially, but this compound might have isomerized faster than the \(E,E\) isomer. A study of the isomerization showed that regardless of the initial mixture of 8,10-dodecadien-1-ol acetate isomers, almost complete equilibration existed after one month. The equilibrium mixture consisted of 9\% \(Z8,E10\), 65\% \(E8,E10\), 23\% \(E8,Z10\), and 3\% \(Z8,Z10\). Concentrations in rubber septa (1:4 ratio of \(E,E\) to \(E,Z\)) of 0.03–3.0 mg/septum produced equivalent trap catches.

Key Words—\textit{Melissopus latiferreanus}, Lepidoptera; Tortricidae, Olethreutinae, filbertworm, sex pheromone, sex attractant, \((E,E)\)-8,10-dodecadien-1-ol acetate, \((E,Z)\)-8,10-dodecadien-1-ol acetate, conjugated diene isomerization.

\(^1\)This paper reports the results of research only. Mention of a commercial product in this paper does not constitute a recommendation by the U.S. Department of Agriculture.
INTRODUCTION

The filbertworm, Melissopus latiferreanus (Walsingham), is a pest of filberts in Oregon and Washington and walnuts and pomegranates in California. Previously, from field screening trials, we identified \((E,E)-8,10\text{-dodecadien-1-ol acetate (E8,E10-12:Ac)}\) as an attractant for male \(M.\ latiferreanus\) (Davis and McDonough, 1981). Subsequently, we undertook a chemical study of the electroantennogram (EAG) active components extracted from female abdominal tips and identified two components which were then evaluated in field tests. These laboratory and field studies are the subject of this report.

METHODS AND MATERIALS

Insects. Filbert nuts were collected from the ground in an abandoned orchard near Dundee, Oregon, on September 14, 15, and 16, 1981. The nuts were maintained in a rearing room at a temperature of 21°C, 65% relative humidity, and a 16-hr day length. The day length was reduced by 2 hr per week until a 12-hr day length was reached. Corrugated cardboard strips (2 cm wide) were provided for the insects to diapause in.

On November 19, strips containing 1868 cocoons were placed in an environmental chamber to induce diapause. The chamber was set at 2.8°C, a relative humidity of 38-40%, and with total darkness.

On January 6, 1982, 592 cocoons were removed from the chamber and returned to the rearing room at a temperature of 18°C, 50-55% relative humidity, and a photophase of 12 hr. After one week the temperature was raised to 21°C and the photophase was increased to 14 hr. After the second week the temperature was raised to 24°C and the photophase was increased to 16 hr.

The first emergence occurred on February 25, 1982, and subsequently a total of 309 adult moths (52.7% males and 47.3% females) emerged.

On March 1 the remaining strips with 1276 cocoons were placed in a rearing room with conditions identical to those previously described. The first emergence for this group occurred April 15, 1982, and a total of 733 moths (50.7% males and 49.3% females) subsequently emerged.

Collection of Pheromone. Female moths (2-5 days old) were collected 1 hr after the beginning of scotophase and placed in a refrigerator to inactivate them for at least 10 min prior to dissection. Severed abdominal tips were allowed to steep 15 min in dichloromethane. Then the solution was removed with a syringe. The amount of pheromone obtained per female was usually ca. 2 ng (range 0.5-4.5 ng).

Gas Chromatography. The following gas chromatographic columns were used: (A) silanized glass column (1.8 × 2.3 mm OD) packed with 3%